H. GILLETTE.

ELECTRICALLY OPERATED CLOCK.

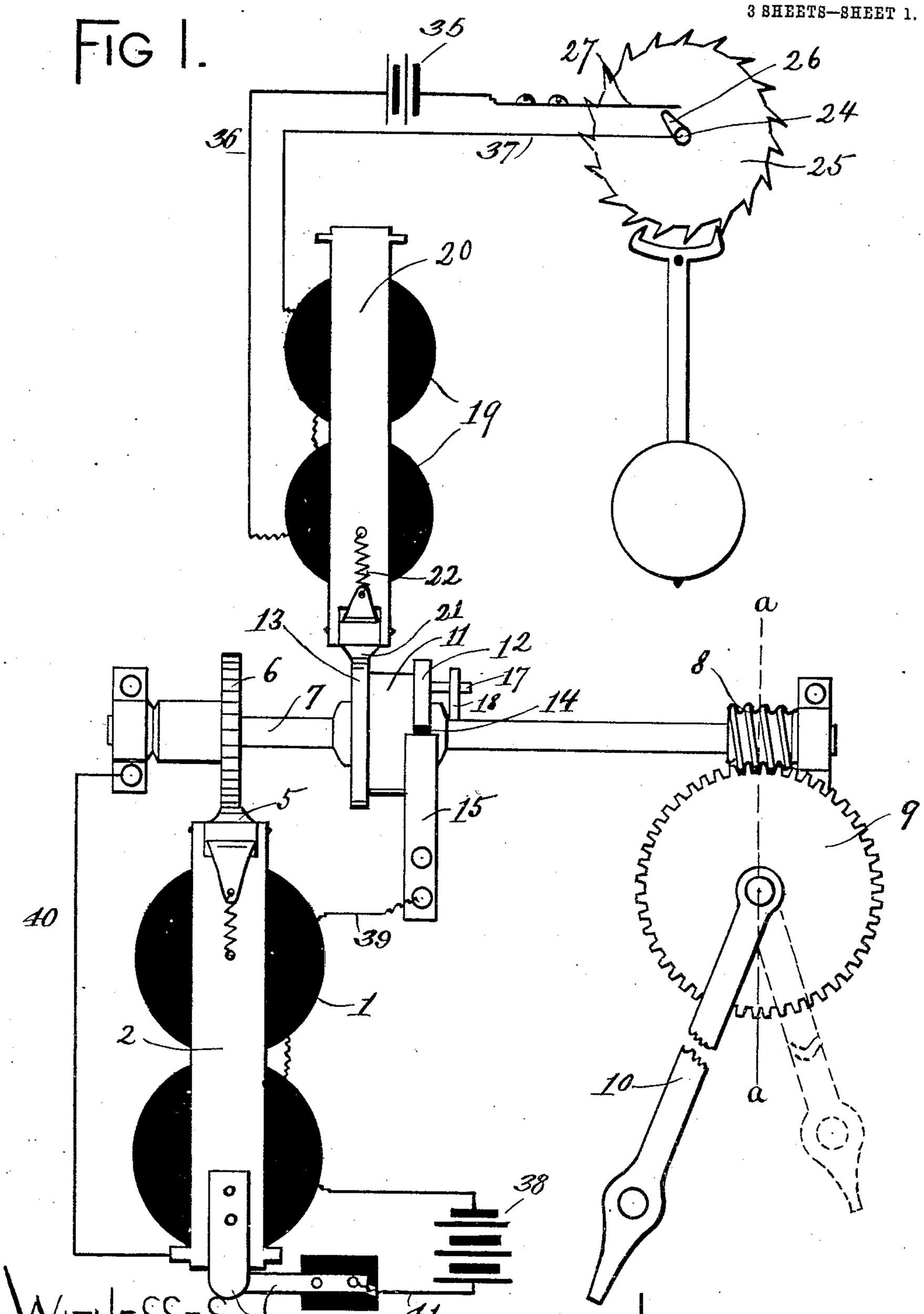
APPLICATION FILED MAR. 11, 1908.

933,899.

Patented Sept. 14, 1909.

3 SHEETS—SHEET 1.

FIG 1.



WITNESSES:

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E. L. Moore.

INVENTOR:

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BY Rudolph [illegible] ATTY.

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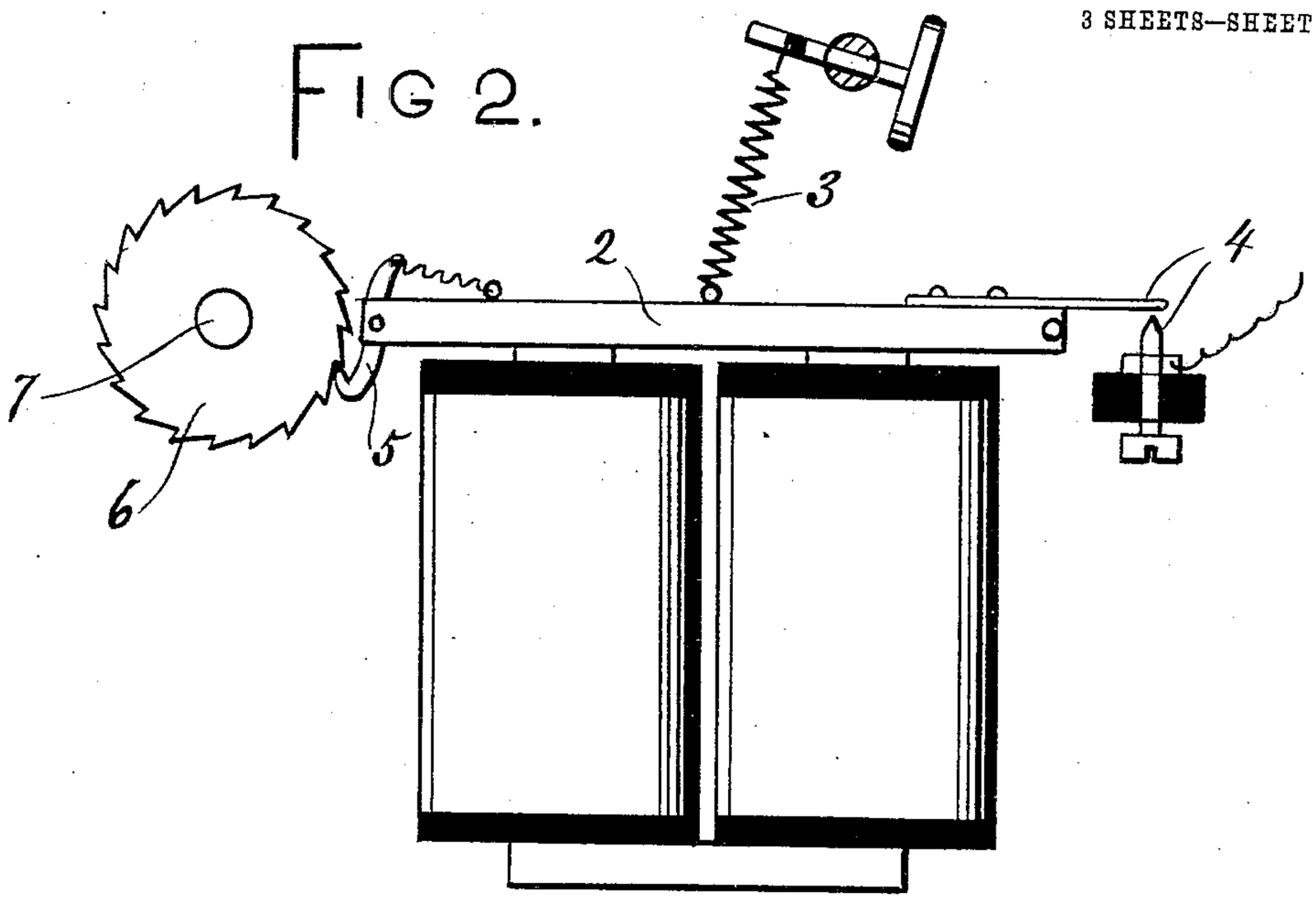
3 SHEETS—SHEET 2.

FIG 2.



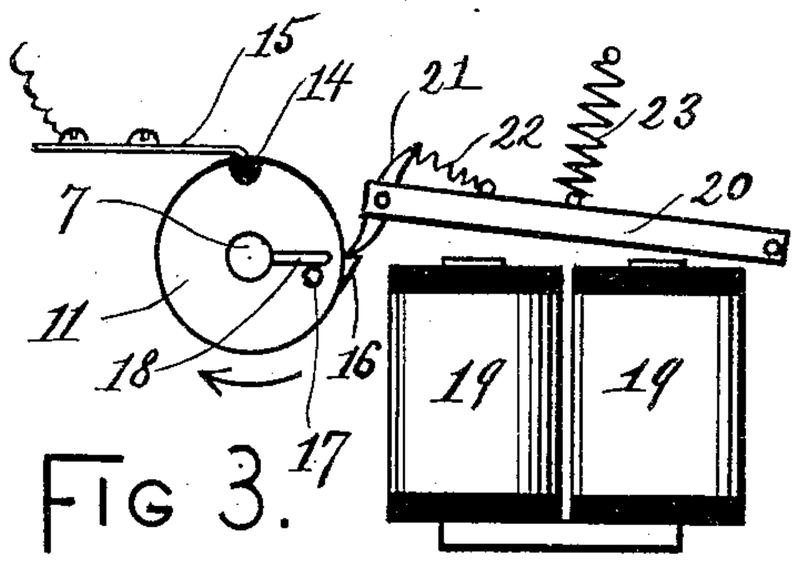


FIG 3.

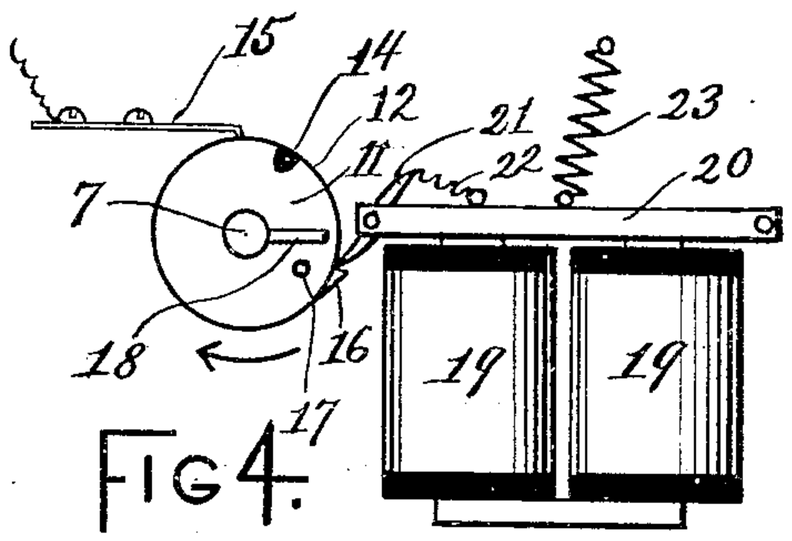


FIG 4.

FIG 5.

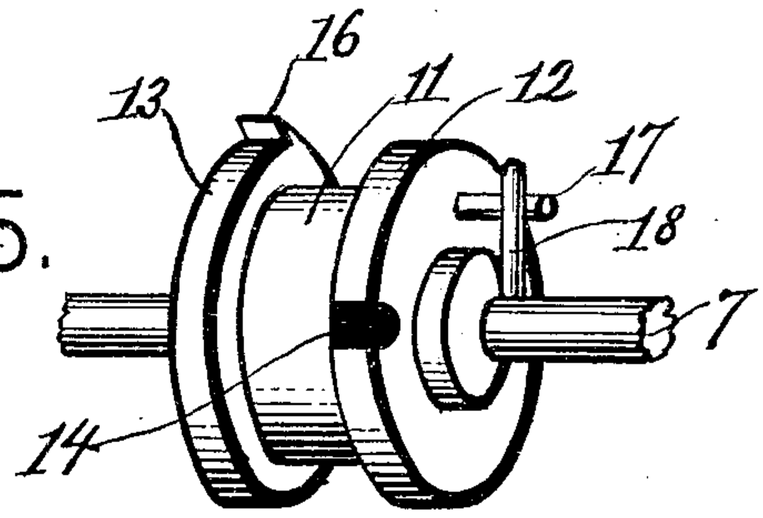
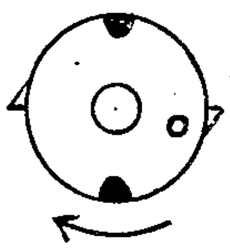


FIG 6.



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3 SHEETS—SHEET 3.

Fig 9.

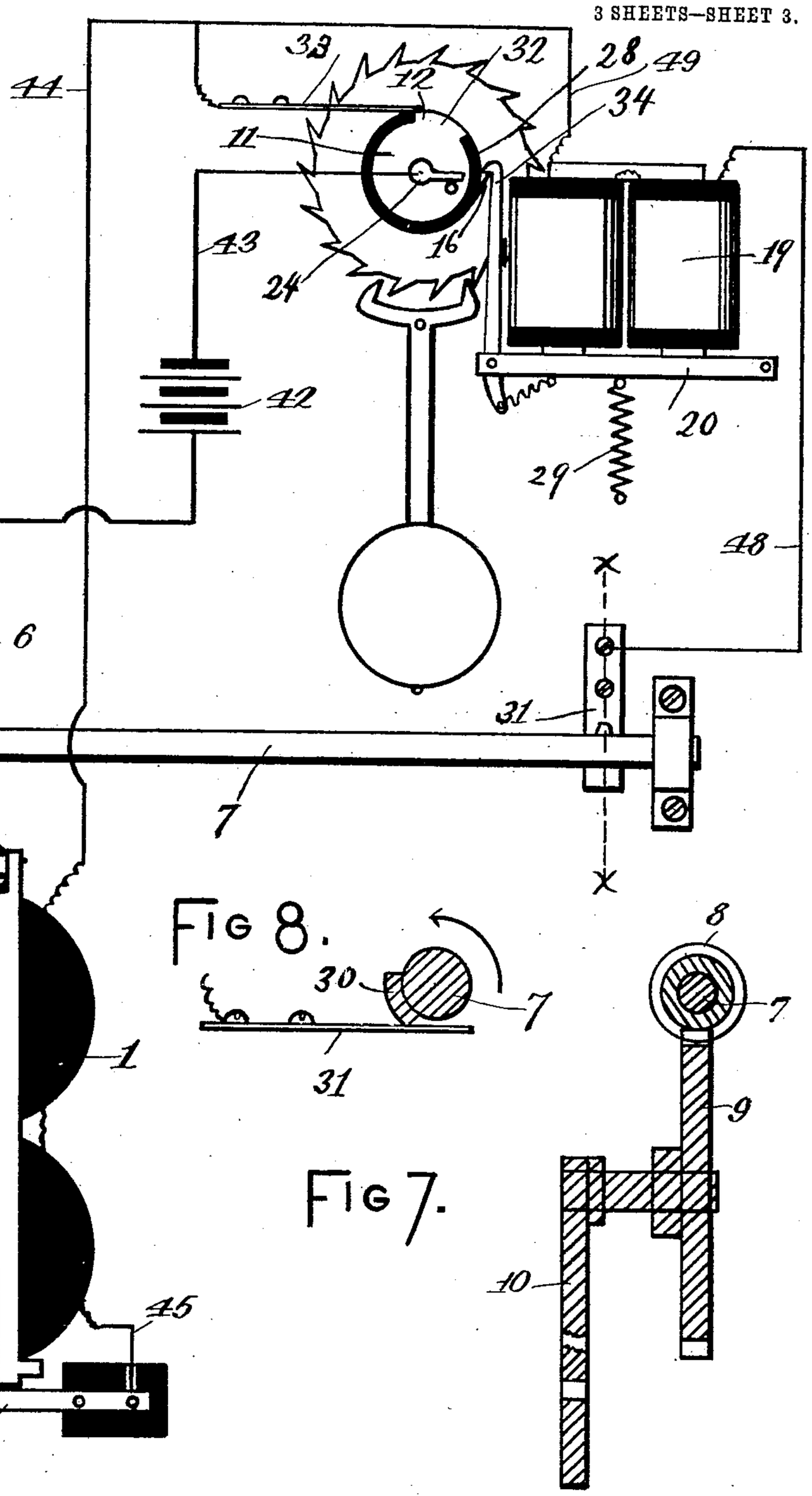

Fig 8.

Fig 7.

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UNITED STATES PATENT OFFICE.

HARLEIGH GILLETTE, OF CHICAGO, ILLINOIS.

ELECTRICALLY-OPERATED CLOCK.

933,899. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed March 11, 1908. Serial No. 420,324.

To all whom it may concern:

Be it known that I, HARLEIGH GILLETTE, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electrically-Operated Clocks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a novel construction in an electrically operated clock, the object being to provide a device of this character which will keep accurate time and is adapted for very large clocks such as tower clocks and clocks used for advertising purposes which are required to be very large and conspicuous, and consists in the features of construction and combinations of parts hereinafter fully described.

In the accompanying drawings illustrating my invention: Figure —1— is a diagrammatic view showing the mechanism operating the minute hand of the clock and the means controlling the same. Fig. —2— is a view showing the electromagnetic motor employed. Figs. —3— and —4— are views of an electromagnetically operated circuit breaker employed and illustrating respectively two positions thereof. Fig. —5— is a detail perspective view of a rotary switch employed. Fig. —6— is an end elevation of a modified form of construction of the latter. Fig. —7— is a detail central vertical section on the line *a*—*a* of Fig. —1—. Fig. —8— is a detail section on the line *x*—*x* of Fig. —9—. Fig. —9— is a view similar to Fig. —1— showing a modified form of construction.

The present invention relates more particularly to the means employed to impart movement to the minute hand of the clock including the specific arrangement of electric circuits controlling and actuating said means in order to render the clock less sensitive to atmospheric influences and prevent short circuiting of the motor circuit thereby. The said means include the specific adaptation of the motor employed whereby momentum of the latter and the driven mechanism to move the hands farther than desired is entirely avoided.

The hands of the clock, being exposed, are liable to become coated with ice and sleet in stormy weather and the load upon the actuating mechanism is thereby increased and rendered far more variable than under normal conditions. Furthermore, the mechanism of large clocks is more exposed to the weather than that of smaller clocks as the casings thereof can hardly be made as thoroughly weather and dust proof. This is particularly true of the advertising clocks which generally are located in exposed positions on the roofs of buildings. Hence, delicacy of any part of the operating mechanism must be obviated without, however, affecting the accuracy of its operation. To obtain these results I have devised mechanism consisting of an electromagnetic motor —1— comprising electromagnets and a vibrating armature —2— actuated thereby against the action of a spring —3— and actuating a circuit make-and-break device —4— of well known construction. The said armature —2— carries a pivoted pawl —5— engaging a ratchet wheel —6— rigidly mounted on a shaft —7— carrying the worm —8— which meshes with and engages the worm wheel —9— actuating the minute hand —10— of the clock. Said motor —1— while in operation, rotates said shaft —7— to turn said worm wheel through a given arc during each revolution of said shaft. On said shaft —7— there is loosely disposed a rotary switch —11— consisting of a drum equipped at its ends with annular flanges —12— and —13—, the flange —12— having insulation —14— disposed in its periphery at one point. A brush —15— disposed in the motor circuit bears upon the periphery of said flange —12— and when in contact with said insulation —14— opens the motor circuit. The flange —13— is equipped at a given point relatively to the location of said insulation —14— in the flange —12— with a single projecting ratchet tooth —16—. Projecting from said drum at one end is a pin —17— which is adapted to be engaged by an arm —18— on the shaft —7— to rotate said drum with said shaft. Disposed in operative relation to said drum —11— is an electromagnetic shifting device consisting of electromagnets —19— and a pivoted armature —20— adapted to be actuated thereby, the latter carrying a pivoted pawl —21— maintained normally in contact with the periphery of said flange —13— by means of a spring —22— and adapted to engage said tooth —16— to rotate said drum —11— sufficiently to pass the insulation —14— from

contact with the brush —15— and thus close the motor circuit. The said armature —20— is normally maintained at the outer limit of its movement by a spring —23— and is actuated by the magnets —19— against the action thereof to impart movement to said drum —11—. The insulation —14— and the tooth —16— are relatively so disposed with relation to the relative disposition of the brush —15— and the normal position of the pawl —21— that said tooth —16—, will have just passed said pawl when the insulation —14— comes into contact with the brush —15—.

The circuit through the magnets —19— is controlled by a circuit closer actuated by the shaft —24— of the escapement wheel —25— and consisting in the instance illustrated, of an arm —26— on said shaft which is disposed in one side of the line, and which engages a brush —27—, disposed in the other side of the line, the said circuit being closed once during each revolution of the shaft —24— and preferably maintained closed during an interval just sufficient to insure energization of said magnets —19— long enough to impart a full stroke to the armature —20—. Thus each time that the circuit through the magnets —19— is completed, the armature —20— moves the drum —11— to close the motor circuit. The motor now operates to rotate the shaft —7—, and the arm —18— of the latter engages the pin —17— and thus causes said drum to be rotated with said shaft until the motor circuit is again broken by contact of the insulation —14— with the brush —15—. In the instance illustrated the insulation 14 is provided at only one point in the periphery of the flange 12 of the drum 11 and therefore, the circuit after being closed by the initial movement of said drum by the armature 20, must receive additional movement from shaft 7 to make a complete revolution of the drum before the circuit is again opened.

While I have illustrated a single insulation —14— and tooth —16— respectively, the number of the same may be increased as shown in Fig. —6—, such increase necessitating, as will be obvious, other corresponding changes in the mechanism which I have omitted from illustration as being superfluous.

It is essential, of course, that the motor circuit be maintained normally closed at the make-and-break device —4—, this being accomplished by normally maintaining the armature —2— at the outer limit of its movement by means of the spring, —3—. It will be noted that the latter also actuates the ratchet wheel —6—, this being very important to prevent short circuiting of the motor circuit in the event that the clock should become clogged with ice and the resistance thus exceed the power of said spring —3—, the pawl —5— in that event engaging a tooth of said wheel —6— which will hold the armature in position to maintain the make-and-break device open. The use of the worm and worm wheel to actuate the minute hand is also a very essential feature of the invention as such gearing locks the hand against revolution by high winds and other causes and renders the operation of the clock less delicate and more easily accurate inasmuch as there is no lost motion in the gear train as is the case where other forms of transmission are employed.

The motor employed and the manner of gearing the same to the shaft —7— constitutes a very important feature of the invention as such motor acquires no momentum nor does said shaft so that the instant the motor circuit is opened movement stops. Hence, the hand is moved through a given arc and no farther. This also insures proper position of the circuit closing means employed to again close the motor circuit at the proper interval.

The electric circuits are as follows in the master clock. Brush 27 to battery 35, wire 36 to electromagnets 19, wire 37 to shaft 24 and arm 26. In the secondary clock, from battery 38 to electromagnets 1, wire 39 to brush 15, thence through drum 11 to shaft 7 and one of its bearings, thence through wire 40 to armature 2, thence through make and break 4 and wire 41 to battery 38.

In Fig. —9— I have illustrated a modified form of construction in which the motor —1— driving the shaft —7— is disposed in the same circuit as the electromagnetic shifting device 19—20. In said construction the drum —11— is loosely disposed on the shaft —24— and is rotated by the latter in the manner hereinbefore described. The insulation —28— on the flange —12— of said drum —11— extends over the greater portion of the periphery of said flange so that the circuit is maintained closed by the latter during a short instead of a longer interval. The shifting device 19—20 operates in the reverse direction, the spring —29— actuating the armature to open the circuit. On the shaft —7— is an arm —30— which contacts with a spring or brush —31— to close the circuit through the shifting device 19—20 said circuit being normally open. As said drum is rotated the motor circuit is closed as soon as the exposed portion —32— of the flange —12— contacts with the brush —33—, said circuit remaining closed until said portion —32— has moved out of such contact. As soon as the motor circuit is closed said motor —1— rotates the shaft —7— and as soon as the arm —30— contacts with the spring or brush —31— the circuit through the electromagnets —19— is closed, thus attracting the armature —20— and raising the pawl —34— carried thereby, said armature retaining this position until the arm —30—

passes out of contact with said brush —31— and opens the circuit. Meanwhile the escapement shaft —24— will have rotated the drum —11— to bring the tooth —16— into the path of the pawl —34— so that the instant the circuit through the magnets —20— is opened said pawl engages said tooth —16— and thus rotates said drum to throw the exposed portion —32— out of contact with the brush —33— thus opening the motor circuit.

In the construction shown in Fig. 9 the circuits are as follows: from the battery 42 through wire 43 to shaft 24; drum 11 to brush 33, wire 44 to electromagnets 1, through wire 45, make and break 4 and wire 46 to bearing of shaft 7 and thence through wire 47 to battery 42. The other circuit is from battery 42, through wire 47 to shaft 7 and circuit closer 30—31, through wire 48 to electromagnets 19, through wire 49 to brush 33, drum 11, shaft 24 and wire 43 to battery 42.

The modified form of construction is not very practical for the reason that the escapement is forced to do too large a part of the work and further because the length of the segment —32— would require to be too exactly adjusted with relation to the respective speeds of the shaft —24— and —7— in order to insure perfect operation. For example, if said segment is too long, the motor will turn the shaft —7— beyond a complete revolution, and if too short the motor circuit may be opened before the circuit through the magnets —20— is closed, or before the tooth —16— reaches the path of the pawl —34—.

I claim as my invention:

1. An electrically actuated clock comprising in combination a master clock and a secondary clock, an electrically actuated motor actuating said secondary clock, a circuit controlling said motor, a rotating circuit closer controlling said circuit, a second circuit, a circuit closer controlling the same, means interposed in and actuated by said second circuit and operatively disposed relatively to the first-mentioned circuit closer to impart movement to the same, mechanically actuated means operatively engaging said first-mentioned circuit closer to further actuate the same, the movement imparted thereto by one of said means serving to close the circuit through said motor and the movement imparted by the other thereof serving to open said circuit.

2. In a secondary clock, a motor actuating the same, an electric circuit controlling said motor, a rotating circuit closer controlling said circuit, electrically actuated means controlled by a master clock and imparting movement to said circuit closer to close said circuit, and mechanically actuated means imparting secondary movement to said circuit closer to open said circuit.

3. In a secondary clock, a motor actuating the same, an electric circuit controlling said motor, a rotating circuit closer controlling said circuit, electrically actuated means controlled by a master clock and imparting movement to said circuit closer to close said circuit, and means actuated by said motor imparting secondary movement to said circuit closer to open said circuit.

4. In an electrically actuated clock, a shaft actuating the hands, a ratchet wheel rigid thereon, a vibrating armature equipped with a pawl actuating said ratchet wheel, electromagnets actuating said armature, a circuit controlling said magnets and being opened and closed by said armature, a traveling circuit closer controlling said circuit through said magnets and operatively disposed with relation to said shaft to be actuated thereby, said circuit closer normally maintaining said circuit open, a master clock, a circuit controlled thereby, a magnet disposed in said circuit, and an armature actuated thereby and operatively disposed with relation to said traveling circuit closer to impart initial movement thereto to close the first named magnet circuit.

5. In an electrically operated clock, a master clock, an electric circuit controlled thereby, electrically actuated means interposed in said circuit, a motor, a circuit controlling the same, circuit closing means controlling the motor circuit, operative connection between the said electrically actuated means and said motor circuit controlling means to close said motor circuit when the first named electric circuit is closed, operative connection between said motor and said motor circuit closing means to reopen the motor circuit at a predetermined interval, a shaft actuated by said motor, time indicating hands, and gearing between the latter and said shaft.

In testimony whereof, I have signed my name in the presence of two subscribing witnesses.

HARLEIGH GILLETTE.

Witnesses:
RUDOLPH WM. LOTZ,
ALBERT W. NEWCOMB.